

Application No. 09/921,844
Amendment dated May 30, 2007
Reply to Office Action of February 21, 2007

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented) An interbody spinal implant for insertion between adjacent vertebral bodies of a human spine, said implant comprising:

a leading end for introduction of said spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through said leading and trailing ends;

opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement in engagement with the bone of one of the vertebral bodies and said opposite lower surface adapted for placement in engagement with the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and

a plurality of surface projections formed on said upper and lower surfaces of said implant, at least a first and a second of said surface projections each having at least one forward facing facet directed at least in part toward said leading end and at least one rearward facet directed at least in part toward said trailing end, each of said forward facet and rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, at least a portion of said rearward facet of said first surface projection overlying a portion of said forward facet of said second surface projection.

Claim 2 (cancelled).

3. (original) The spinal implant of claim 1, wherein said rearward facet is at an angle to at least one of said upper and lower surfaces of said implant.

Claim 4 (cancelled).

5. (original) The spinal implant of claim 3, wherein said angle is greater than 90 degrees.

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Claims 6-18 (cancelled).

19. (previously presented) The spinal implant of claim 1, wherein said surface projections are oriented relative to one another to form an array.
20. (previously presented) The spinal implant of claim 1, wherein said surface projections are geometrically disposed relative to one another.
21. (original) The spinal implant of claim 1, wherein said upper and lower surfaces of said implant are at least in part arcuate.
22. (original) The spinal implant of claim 1, wherein at least one of said leading end, trailing end, and sides are curved.
23. (original) The spinal implant of claim 1, wherein said sides are curved.
24. (original) The spinal implant of claim 1, wherein each of said leading end, trailing end, and sides are curved.
25. (original) The spinal implant of claim 24, wherein said leading end, trailing end, and sides form a circle.
26. (original) The spinal implant of claim 1, wherein said upper and lower surfaces of said implant are at least in part planar.
27. (previously presented) The spinal implant of claim 1, wherein said upper and lower surfaces converge toward each other along at least a portion of the length of said implant.
28. (original) The spinal implant of claim 1, wherein said implant comprises a material other than bone.
29. (original) The spinal implant of claim 1, wherein said implant comprises bone.
30. (original) The spinal implant of claim 29, wherein said bone includes cortical bone.
31. (original) The spinal implant of claim 1, wherein said implant comprises bone growth promoting material.
32. (previously presented) The spinal implant of claim 31, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.

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33. (original) The spinal implant of claim 1, wherein said implant is treated with a bone growth promoting substance.
34. (original) The spinal implant of claim 1, wherein said implant is a source of osteogenesis.
35. (original) The spinal implant of claim 1, wherein said implant is at least in part bioabsorbable.
36. (original) The spinal implant of claim 1, wherein said implant comprises metal.
37. (original) The spinal implant of claim 36, wherein said metal is ASTM material suitable for use as a spinal fusion implant.
38. (original) The implant of claim 36, wherein said metal includes titanium.
39. (original) The implant of claim 1, wherein said implant comprises a plastic material.
40. (original) The implant of claim 1, wherein said implant comprises a ceramic material.
41. (original) The implant of claim 1, wherein said implant is formed of a porous material.
42. (original) The implant of claim 1, wherein said implant is formed of a material that intrinsically participates in the growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.
43. (original) The spinal implant of claim 1, wherein said implant is a motion preserving device adapted to space apart and allow motion between the adjacent vertebral bodies.
44. (original) The spinal implant of claim 1, wherein said spinal implant is a fusion implant.
45. (previously presented) The spinal implant of claim 44, wherein said upper and lower surfaces include at least one opening to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
46. (original) The spinal implant of claim 44, wherein said implant has an internal chamber and an access opening for accessing said internal chamber.

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47. (original) The spinal implant of claim 46, wherein said implant has a cap for closing said access opening.
48. (previously presented) The spinal implant of claim 46, wherein said upper and lower surfaces include at least one opening in communication with said internal chamber to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
49. (original) The spinal implant of claim 46, wherein said internal chamber is capable of containing bone growth promoting material.
50. (previously presented) The spinal implant of claim 49, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
51. (original) The spinal implant of claim 1, further comprising at least one opening capable of retaining fusion promoting materials.
52. (withdrawn) The spinal implant of claim 1, further comprising at least one cut cleaving said surface projection into at least two portions.
53. (withdrawn) The spinal implant of claim 52, further comprising at least a second cut cleaving said surface projection into at least four portions.
54. (withdrawn) The spinal implant of claim 52, where said cut penetrates said surface projection at a depth substantially equal to that of the height of said surface projection.
55. (withdrawn) The spinal implant of claim 53, where said second cut penetrates said surface projection at a depth substantially equal to that of the height of said surface projection.
56. (withdrawn) The spinal implant of claim 52, wherein said cut is oriented along one of the mid-longitudinal axis of said implant, an axis perpendicular to the mid-longitudinal axis of said implant, and an axis at an angle between the mid-longitudinal axis and the axis perpendicular to the mid-longitudinal axis of said implant.

Claims 57-130 (cancelled).

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131. (currently amended) An interbody spinal implant for insertion between adjacent vertebral bodies of a human spine, said implant comprising:

a leading end, an opposite trailing end, a mid-longitudinal axis passing through said leading and trailing ends, and right and left sides between said leading and trailing ends, said right and left sides being spaced apart on opposite sides of the mid-longitudinal axis and;

opposite upper and lower surfaces between said leading and trailing ends and said right and left sides, said upper surface adapted for placement in engagement with the bone of one of the vertebral bodies and said opposite lower surface adapted for placement in engagement with the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and

a plurality of surface projections formed on said upper and lower surfaces of said implant, each of said surface projections having a plurality of facets, each of said facets having a perimeter defining each facet, at least a first and a second of said surface projections each having at least ~~one~~ ~~right~~ a first facet directed ~~at least in part toward~~ ~~said right side~~ and at least ~~one~~ ~~left~~ a second facet directed ~~at least in part toward~~ ~~opposite~~ ~~said left side~~ first facet, each of said ~~right~~ first and ~~left~~ second facets having a length and a slope, the length of said ~~right~~ first facet being longer than the length of said ~~left~~ second facet, the slope of said ~~left~~ second facet being steeper than the slope of said ~~right~~ first facet, said first and second surface projections having at least one facet with the ~~having a~~ perimeter of said at least one facet having at least a first and a second portion of ~~said perimeter being~~ arranged to form an included angle greater than 90 degrees between said first and second portions of the perimeter.

Claim 132 (cancelled).

133. (currently amended) The spinal implant of claim 131, wherein said ~~left~~ second facet is at an angle to at least one of said upper and lower surfaces of said implant.

Claim 134 (cancelled).

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135. (original) The spinal implant of claim 133, wherein said angle is greater than 90 degrees.

Claim 136 (cancelled).

137. (previously presented) The spinal implant of claim 131, wherein said projections are oriented relative to one another to form an array.
138. (original) The spinal implant of claim 131, wherein said projections are geometrically disposed relative to one another.
139. (original) The spinal implant of claim 131, wherein said upper and lower surfaces of said implant are at least in part arcuate.
140. (original) The spinal implant of claim 131, wherein said upper and lower surfaces of said implant are at least in part planar.
141. (previously presented) The spinal implant of claim 131, wherein said upper and lower surfaces converge toward each other along at least a portion of the length of said implant.
142. (original) The spinal implant of claim 131, wherein said implant comprises bone growth promoting material.
143. (previously presented) The spinal implant of claim 142, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
144. (original) The spinal implant of claim 131, wherein said implant is a motion preserving device adapted to space apart and allow motion between the adjacent vertebral bodies.
145. (original) The spinal implant of claim 131, wherein said spinal implant is a fusion implant.

Claims 146-202 (cancelled).

203. (previously presented) The spinal implant of claim 1, in combination with a fusion promoting substance.
204. (previously presented) The spinal implant of claim 203, wherein said fusion promoting substance includes at least one of bone, bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.

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205. (previously presented) The spinal implant of claim 131, in combination with a fusion promoting substance.
206. (previously presented) The spinal implant of claim 205, wherein said fusion promoting substance includes at least one of bone, bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
207. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base that is adjacent to one another.
208. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base, said bases being spaced apart from one another along a direction generally parallel to the mid-longitudinal axis of said implant.
209. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base, said bases being spaced apart from one another along a direction generally transverse to the mid-longitudinal axis of said implant.

Claims 210-212 (cancelled).

213. (previously presented) The spinal implant of claim 131, wherein each of said first and second surface projections have a base, said bases being adjacent to one another.
214. (previously presented) The spinal implant of claim 131, wherein each of said first and second surface projections have a base, said bases being spaced apart from one another along a direction generally parallel to the mid-longitudinal axis of said implant.
215. (previously presented) The spinal implant of claim 131, wherein each of said first and second surface projections have a base, said bases being spaced apart from one another along a direction generally transverse to the mid-longitudinal axis of said implant.

Claims 216-218 (cancelled).

219. (currently amended) An interbody spinal implant for insertion between adjacent vertebral bodies of a human spine, said implant comprising:

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a leading end for introduction of said spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through said leading and trailing ends;

opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement in engagement with the bone of one of the vertebral bodies and said opposite lower surface adapted for placement in engagement with the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and

a plurality of surface projections formed on said upper and lower surfaces of said implant, at least a first and a second of said surface projections each having a peak, at least one forward facing facet directed at least in part toward said leading end and at least one rearward facet directed at least in part toward said trailing end, each of said forward facet and rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, ~~said first and second surface projections each having an included angle between said rearward facet and the base greater than 90 degrees relative to at least one of said upper and lower surfaces of said implant~~ said at least one forward facet and said at least one rearward facet converging at said peak, said rearward facet having a perimeter with a first included angle proximate said peak and said forward facet having a perimeter with a second included angle proximate said peak, said first included angle being greater than said second included angle.

Claims 220-227 (cancelled).

228. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces of said implant are at least in part arcuate.
229. (previously presented) The spinal implant of claim 219, wherein at least one of said leading end, trailing end, and sides are curved.

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230. (previously presented) The spinal implant of claim 219, wherein said sides are curved.
231. (previously presented) The spinal implant of claim 219, wherein each of said leading end, trailing end, and sides are curved.
232. (previously presented) The spinal implant of claim 231, wherein said leading end, trailing end, and sides form a circle.
233. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces of said implant are at least in part planar.
234. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces converge toward each other along at least a portion of the length of said implant.
235. (previously presented) The spinal implant of claim 219, wherein said implant comprises a material other than bone.
236. (previously presented) The spinal implant of claim 219, wherein said implant comprises bone.
237. (previously presented) The spinal implant of claim 236, wherein said bone includes cortical bone.
238. (previously presented) The spinal implant of claim 219, wherein said implant comprises bone growth promoting material.
239. (previously presented) The spinal implant of claim 238, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
240. (previously presented) The spinal implant of claim 219, wherein said implant is treated with a bone growth promoting substance.
241. (previously presented) The spinal implant of claim 219, wherein said implant is a source of osteogenesis.
242. (previously presented) The spinal implant of claim 219, wherein said implant is at least in part bioabsorbable.
243. (previously presented) The spinal implant of claim 219, wherein said implant comprises metal.

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244. (previously presented) The spinal implant of claim 243, wherein said metal includes titanium.
245. (previously presented) The spinal implant of claim 219, wherein said implant comprises at least one of a plastic material and a ceramic material.
246. (previously presented) The spinal implant of claim 219, wherein said implant is formed of a porous material and a material that intrinsically participates in the growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.
247. (previously presented) The spinal implant of claim 219, wherein said implant is a motion preserving device adapted to space apart and allow motion between the adjacent vertebral bodies.
248. (previously presented) The spinal implant of claim 219, wherein said spinal implant is a fusion implant.
249. (previously presented) The spinal implant of claim 248, wherein said upper and lower surfaces include at least one opening to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
250. (previously presented) The spinal implant of claim 248, wherein said implant has an internal chamber and an access opening for accessing said internal chamber.
251. (previously presented) The spinal implant of claim 250, wherein said upper and lower surfaces include at least one opening in communication with said internal chamber to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
252. (previously presented) The spinal implant of claim 250, wherein said internal chamber is capable of containing bone growth promoting material.
253. (previously presented) The spinal implant of claim 252, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
254. (previously presented) The spinal implant of claim 219, further comprising at least one opening capable of retaining fusion promoting materials.

Claims 255-258 (cancelled).

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259. (previously presented) The spinal implant of claim 1, wherein said first and second surface projections each have opposed side facets directed generally toward said spaced apart sides of said implant, respectively, said side facets being located between said forward facet and said rearward facet of each of said first and second surface projections, said side facets converging toward each other in a direction away from one of said upper and lower surfaces of said implant.
260. (previously presented) The spinal implant of claim 259, wherein said opposed side facets intersect each other.
261. (previously presented) The spinal implant of claim 260, wherein said opposed side facets converge to form a peak at the top of said surface projection.
262. (previously presented) The spinal implant of claim 261, wherein said peaks of at least two of said surface projections are aligned along lines that are at least one of perpendicular, parallel, and diagonal to the mid-longitudinal axis of said implant.
263. (previously presented) The spinal implant of claim 261, wherein said peak of said first surface projection overlies at least a portion of said second surface projection.
264. (previously presented) The spinal implant of claim 261, wherein said peaks of said first and second surface projections are at the same height above one of said upper and lower surfaces of said implant.
265. (previously presented) The spinal implant of claim 259, wherein adjacent side facets of adjacent surface projections are spaced apart to define a groove therebetween.
266. (previously presented) The spinal implant of claim 259, wherein a plurality of adjacent surface projections are spaced apart to form a plurality of grooves therebetween.
267. (previously presented) The spinal implant of claim 266, wherein at least one of said grooves is parallel to the mid-longitudinal axis of said implant.

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268. (previously presented) The spinal implant of claim 266, wherein at least two of said grooves cross each other.
269. (previously presented) The spinal implant of claim 266, wherein at least one of said grooves has a horizontal cross-sectional shape that is one of a v-shape, u-shape, and a box-like shape.
270. (previously presented) The spinal implant of claim 259, wherein each of said first and second surface projections have a base and said side facets have a maximum width therebetween at said base, said base being spaced apart from a base of another of said surface projections by a distance no greater than one-half the maximum width of one of said first and second surface projections.
271. (previously presented) The spinal implant of claim 1, wherein said forward facets of each of said first and second surface projections face the same direction.
272. (currently amended) The spinal implant of claim 131, wherein said first and second surface projections each have opposed side facets directed generally toward said leading and trailing ends, respectively, said side facets being located between said right first facet and said left second facet of each of said first and second surface projections, said side facets converging toward each other in a direction away from the base of each of said first and second surface projections.
273. (previously presented) The spinal implant of claim 272, wherein adjacent side facets of adjacent surface projections are spaced apart to define a groove therebetween.
274. (previously presented) The spinal implant of claim 272, wherein each of said first and second surface projections have a base and said side facets have a maximum width therebetween at said base, said base being spaced apart from a base of another of said surface projections by a distance no greater than one-half the maximum width of one of said first and second surface projections.
275. (previously presented) The spinal implant of claim 272, wherein said opposed side facets converge to form a peak, said peaks of said first and second surface

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projections being at the same height above one of said upper and lower surfaces of said implant.

276. (currently amended) The spinal implant of claim 131, wherein said ~~right-first~~ facets of each of said first and second surface projections face the same direction.
277. (previously presented) The spinal implant of claim 219, wherein said surface projections have opposed side facets directed generally toward said sides of said implant, said side facets being located between said forward facet and said rearward facet of said surface projections, said side facets converging toward each other in a direction away from the base of said first and second projections.
278. (previously presented) The spinal implant of claim 277, wherein said opposed side facets converge to form a peak at the top of each of said surface projections.
279. (previously presented) The spinal implant of claim 278, wherein said peaks are aligned along lines that are at least one of perpendicular, parallel, and diagonal to the mid-longitudinal axis of said implant.
280. (previously presented) The spinal implant of claim 277, wherein adjacent side facets of adjacent surface projections are spaced apart to define a groove therebetween.
281. (previously presented) The spinal implant of claim 277, wherein a plurality of adjacent surface projections are spaced apart to form a plurality of grooves therebetween.
282. (previously presented) The spinal implant of claim 281, wherein at least one of said grooves is parallel to the mid-longitudinal axis of said implant.
283. (previously presented) The spinal implant of claim 281, wherein at least two of said grooves cross each other.
284. (previously presented) The spinal implant of claim 281, wherein at least one of said grooves has a horizontal cross-sectional shape that is one of a v-shape, u-shape, and a box-like shape.